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HOME BUTTERMAKING

D. H. NELSON[1]

INTRODUCTION

Nearly two-thirds of all the butter made in the United States is manufactured in creameries. The rapid growth of this system has resulted largely from more economical manufacture and from the use of methods that safeguard the health of the consumer. Anyone attempting to market butter must necessarily compete with the factory system; and careful consideration leads to the conclusion that, as a rule, California dairymen cannot afford to market their cream in the form of butter.

Some people who do not have access to good quality fresh milk and cream may conveniently and profitably keep one or two cows to supply their family needs. In such cases there will usually be at certain seasons, more milk or cream than the family requires; and this extra cream can be made into butter for home use. Such home buttermaking, because of its very nature, permits the elimination of some processes required when butter is being marketed and consequently can be undertaken by unskilled workers. Only a small amount of equipment is necessary and careful attention to a few details will insure success.

QUALITY OF CREAM REQUIRED

Buttermaking begins (fig. 1) with obtaining a good quality of clean-flavored milk, because any taint in the milk or cream will, to some extent, be carried into the butter.

Some of the feeds that will injure the flavor of butter are rape, rye, decayed ensilage, leek, onions, or apples when fed in large quantities.

Other causes of taints in butter are leaving the cow's udder and teats in an unclean condition at milking time; milking in unclean stables; using unclean or rusty milking pails; keeping the cream in places where there are objectionable odors; keeping the cream for several days at a temperature above 55° F; letting the cows drink water from stagnant ponds, or that which is contaminated with seepage from barnyards.

In addition, cream used for home buttermaking should be produced by healthy cows. When butter is made for sale, the California State Dairy Law requires that the cream must be produced from cows which have passed the tuberculin test; otherwise the cream must be pasteurized.

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CLEANING UTENSILS

Another important factor is the care of the utensils used in handling the milk. They should always be thoroughly cleaned immediately after use. The best procedure is first to rinse them with lukewarm water to remove the fat, then thoroughly scrub them with a brush and warm water in which washing powder has been dissolved. Soap or soap powders that make suds usually leave a soapy film on the utensils and should

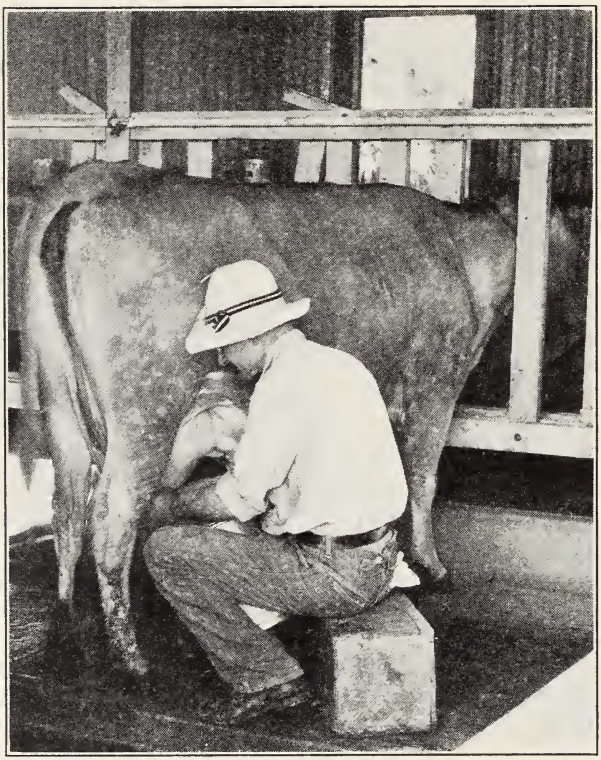

Fig. 1.—Buttermaking begins with obtaining the desired quality of milk and taking the proper care of it until it is churned.

not be used. Soda ash or one of the commercial dairy cleansing powders is satisfactory, being easily rinsed off. After a washing and rinsing with clean, warm water, the utensils should be sterilized with boiling water. The use of a dish towel or cloth for drying is not necessary nor desirable, because the hot utensils will dry themselves if drained and immediately exposed to clean, pure air. In order that they may remain sterile, they should be handled or touched as little as possible. Unclean utensils harbor bacteria and, therefore, when used again, contaminate the milk and cream and develop bad flavors, thus injuring the butter.

CARE OF MILK AND CREAM

Another important factor is the cooling of the milk and cream. The milk should be cooled as rapidly and as soon after milking as possible, and then kept cold, the best temperature being below 50° F. Warm cream should not be mixed with colder cream, for this practice hastens souring.

A satisfactory method of cooling small quantities of milk or cream is to set the container into which the milk is strained in cold water and to stir the milk at intervals of ten minutes until it is cold. Water is a much better cooling agent than air, because it is a better conductor of heat and is capable of absorbing greater quantities of heat. The best results are obtained when ice water is used. If only well water is available, it should be changed several times a day during warm weather. A small stream of cold water is very satisfactory, since it is continually changing without attention. When better facilities are not at hand, a suitable tank or container for the cooling water may be made on the farm. It should be large enough to hold four to five gallons of water for each gallon of milk cooled, and the water should rise at least to the height of the milk in the can. Vinegar barrels, one for each milk can, may be used; or a wooden tank may be made of two-inch lumber properly bolted together and oiled on the inside.

Whatever the style of tank, an inlet pipe should be carried to within a few inches of the bottom by means of an ell and a short piece of pipe, so that the cold water may be conducted to the bottom, thus permitting the warmer water, which rises to the top, to pass out as overflow. The overflow pipe should be at the end of the tank opposite the inlet pipe; it should be of slightly larger diameter and so high that the water will be nearly at the tops of the cans. Lock nuts and sheet packing may be used to make tight joints where pipes enter and leave the tank. Cream cans should stand on cleats in the tank, so that water may circulate under as well as around them. A short piece of board on top of the cans, with its ends slid under cleats nailed to the sides of the tank, will serve to prevent the cans from floating or tipping when only partially filled. In order to afford protection from the heat, a cooling tank should have a tight cover and should be placed away from the hot winds and direct rays of the sun.

SEPARATION

Milk from which cream is to be separated may be placed in shallow pans and set in a cool place, usually a cellar, a spring house, or in cold water, for about 36 hours, to permit the cream to rise. During that time the surface is usually exposed to the air, and the cream absorbs

objectionable odors if any are present; hence, the importance of sanitary surroundings. The cream is removed by first scraping it from the sides of the pan with the milk skimmer[2] shown in figure 2, and then carefully sliding the skimmer under the cream with the least possible disturbance, "dipping it off" into a separate container. Care should be used to get as little skim milk with the cream as possible, for thin cream is difficult to churn. The skim milk resulting from the removal of the cream by this method usually contains 0.5 to 1.5 per cent of milk fat—that is, one-eighth to one-third of all the milk fat in the whole milk.

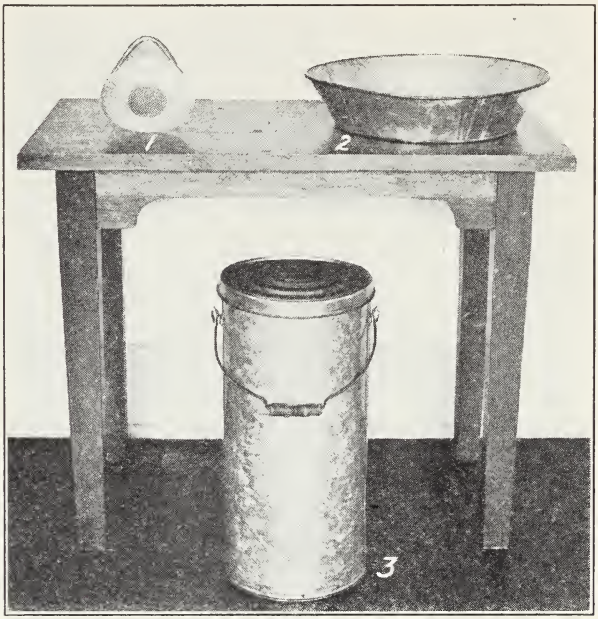

Fig. 2.—Utensils for separating cream: *1*, skimmer; *2*, shallow-pan; *3*, "shot-gun" can.

When the skim milk is used in the home or fed to animals this loss of milk fat may not be important. Souring, which frequently occurs during this time, is undesirable since it prevents the uniform ripening of cream from different separations. It also may limit the usefulness of the skim milk.

Another method of cream separation is to place the milk, as soon as drawn from the cow, in a "shot-gun" can (fig. 2) set in cold water, preferably ice water, for 12 hours. Because of the quick cooling to a low temperature, the cream rises more quickly and more completely

[2] A milk skimmer can usually be purchased in any of the larger hardware stores.

than in the shallow-pan method, and may be skimmed before its fresh, sweet flavor has been lost. It may be removed with the skimmer, as described for the shallow-pan method; or, if a well-tinned faucet is placed at the bottom of the can, the skim milk may be drawn out from under the cream. As with the other method, care should be used to get as little skim milk with the cream as possible. The resulting skim milk can contain as low as 0.2 per cent of milk fat, though often nearer 0.5 per cent, and is sweet. If the milk is not placed in ice water immediately after it has been drawn, the loss of fat is still greater.

A centrifugal or mechanical cream separator gives by far the best results, because the separation is accomplished in a few minutes, while the milk is still warm. The skim milk usually contains only a trace of fat and is available for use at once, while perfectly fresh. Although the ability of the mechanical separator to skim clean makes it a very profitable investment for marketing cream, its use in home buttermaking may not be justifiable.

RIPENING THE CREAM

When the butter is to be stored for a few weeks, it will be found desirable to churn sweet cream. Since the process is a little more difficult than churning sour cream, most home buttermakers first ripen the cream. In this case the cream should be kept in the cooling tank until about 12 hours before churning. In order to ripen uniformly, it should be placed in one receptacle, thoroughly mixed, and warmed slowly to a temperature of 65° to 75° F. Frequent stirrings and the use of a thermometer are necessary to insure uniform and proper temperature throughout. Fresh cream should not be added after ripening has begun. The cream should be allowed to stand at the ripening temperature (from 65° to 75° F) until it thickens, assumes a glossy appearance, and is mildly sour; then it should be cooled quickly to churning temperature or below (usually from 52° to 60° F in the summer and 58° to 66° F in the winter). If the cream is in a can, it may be cooled in the cooling tank and stirred occasionally. Ice or cold water should never be put into the cream. In order that the butter may have the desired firmness of body, the cream should be held at churning temperatures or slightly below for at least two hours before it is churned. Even after cooling, it will continue to sour somewhat; but when ready for churning it should still be only mildly sour, not to exceed 0.6 per cent acidity, as determined by the acidity test.

Special care should be taken to prevent excessive souring, which has two harmful results, in that it gives the butter a sour, overripe cream flavor and it injures its keeping properties.

The souring of cream is caused by the growth of bacteria, which are a simple form of plant life. Some bacteria produce lactic acid and, as a by-product, the flavors that are desirable in butter. Many other types of bacteria, however, grow and produce bad flavors at the temperature used for ripening cream. If the milk or cream has been contaminated by unclean methods during milking or by utensils that have not been properly cleaned and sterilized, "off flavors" will develop in the cream during ripening and will be retained in the butter. Undesirable flavors may develop even in clean cream if the ripening temperature is too high or too low, or if the cream becomes overripe; in fact, an overripe cream flavor is one of the most common defects in butter made in the home.

The organisms that develop the desirable lactic acid and its attendant flavors in the cream are very susceptible to heat and cold. Although they grow and produce acid in a very wide range of temperatures, the flavors that are desired in butter are produced only within a very narrow range. An accurate thermometer and careful control of the ripening temperature are therefore very essential. Lactic-acid bacteria are more active in summer than in winter. For that reason, and because the temperature of the cream during ripening is usually somewhat affected by that of the atmosphere, the ripening process should begin at a higher temperature in winter than in summer. Experience will demonstrate just how to handle the cream so that it will be in the proper condition for churning.

CHURNING TEMPERATURE

The desirable temperature at which to churn is that which makes the butter granules firm but not hard. Under normal conditions, when the churning occupies 30 to 40 minutes, the butter granules will have the proper firmness. The churning temperature necessary depends upon the season of the year and certain other factors, but is generally from 52° to 60° F in the summer and from 58° to 66° in the winter. If the cream is churned at 62° in winter, and the butter comes in 35 minutes, with the granules firm, one notices, as summer approaches and the cows are given green feed, that the cream churns more quickly and the butter is softer. Under these conditions, a lower churning temperature should be used; and thus from season to season the churning temperature is regulated so that the butter granules may have the proper firmness.

When the temperature is either too low or too high, undesirable results are obtained. A low temperature prolongs the churning period unnecessarily, and may even prevent the production of butter. It

causes the granules, especially when the cream is thin, to form in tiny pellets, like fine shot, many of which are lost in the buttermilk. The working of the butter and the incorporation of the salt are accomplished only with great difficulty, and the body of the butter is liable to be brittle or salvy. Adding hot water to cream to warm it, and using wash water more than three degrees warmer than the butter in order to soften it, are bad practices, since they injure the quality. If the proper churning temperature is used, the butter granules will be of the proper firmness.

Too high a churning temperature is even more to be avoided, because it is directly responsible for loss of milk fat in the buttermilk, excess buttermilk in the butter, leakiness, and weak, greasy body.

When the churning temperature is high enough to reduce the churning period to about 10 minutes, the loss of milk fat in the buttermilk may be as great as 1 to 2 per cent, whereas, under proper conditions, the loss usually does not exceed 0.6 per cent. The importance of this loss of fat in the buttermilk depends upon the use of the buttermilk.

When the butter granules are so soft that they do not remain distinct, but stick together in large masses, the washing out of the buttermilk is greatly interfered with, and abnormally large quantities of it are incorporated into the butter. The product then has poor keeping qualities and quickly develops bad flavors. Other things being equal, the less buttermilk or curd in butter, the better are its keeping qualities. The "off-flavors" that so quickly develop in much of the homemade butter are produced by decomposition not of the milk fat but of the milk solids which are found in the buttermilk. Because the drops of moisture expressed from the butter are milky in appearance, the butter is said to have a milky brine and for that reason is discriminated against.

Butter that "comes soft" retains large quantities of moisture from the buttermilk and wash water. Because of this softness, the moisture is not well incorporated, but is found in pockets and large drops. When the butter stands, some of the moisture oozes out; when it is cut, large drops appear on the cut surface. Such butter is said to be "leaky." That fault is objectionable in itself and in addition causes a material shrinkage in the weight.

Butter properly made has a firm, waxy body, but high temperatures during manufacture make it soft and greasy. When eaten it seems to melt slowly and stick to the mouth, in contrast to the quickly melting and quickly disappearing butter with a firm, waxy body.

The use of the proper churning temperature is therefore essential to the production of first-class butter, and the churning period must

occupy 30 to 40 minutes. There is no short cut in churning. Patent churns that yield butter in seven minutes produce practically the same harmful results as those just described.

CHURNING

When cream is ready for churning, the churn should be prepared. It should be cleaned thoroughly, rinsed with scalding water, and then thoroughly rinsed and chilled with cold water.

The butter ladles, paddles, bowl, and printer should be treated in the same way, and all placed in a pail of cold water until needed; otherwise, the butter will stick to them.

Cream should be poured into the churn through a strainer to break up possible lumps and to remove curd particles and any foreign matter. For best results, the churn should be only about one-third full. If it is too full, the churning period is prolonged; and, the cream, in foaming, nearly fills the churn and prevents concussion. In that case, one must usually remove some of the cream in order to obtain butter within a reasonable time. The small churns used in home buttermaking frequently must be set in a pan of water in order to maintain the proper temperature during churning.

Except late in the spring and early in the summer, when butter has a naturally high color, a small quantity of butter color is usually added to the cream. In winter the quantity required to produce a shade of yellow like the desirable April or May color varies from about 20 to 35 drops per gallon of cream.

The color having been added to the cream, the churn may be started at a speed to produce severe agitation. Churns like that shown in figure 3, equipped with a revolving dasher, should be turned from 70 to 100 revolutions of the handle per minute. The same uniform speed should be used every time in order to enable the buttermaker to properly control the churning temperature.

When the churning is nearly completed, the dasher will turn a little harder; but when the butter "breaks," it will turn more easily again. If the correct churning temperature is used, the butter should break in very small granules, which soon "gather" into larger ones. When the granules are the size of grains of wheat, or too large to pass through the strainer, the churning is completed. Careful attention is required at this time because a few revolutions of the handle may produce granules that are too large to give the best results. Large granules incorporate quantities of buttermilk that cannot be washed out; the bad effect of this condition has already been discussed.

As soon as the churning is completed, the buttermilk may be drawn off through the strainer in the top of the churn. If there is no such strainer, the buttermilk should be poured through something similar to a tea strainer, but used for nothing except cream or buttermilk.

CHURNING DIFFICULTIES

Sometimes the home buttermaker may find it difficult to churn a batch of cream, even though the above directions are closely followed. Therefore the common causes of difficult churning together with their respective remedies will be discussed for the sake of emphasis.

Fig. 3.—Equipment for making butter in the home: *1*, butter printer; *2*, churn; *3*, wooden bowl; *4*, butter ladle; *5*, butter paddle; *6*, thermometer.

When the churning temperature is too low the cream will whip up and fail to break into butter granules. Warming the cream one or two degrees usually causes the butter to come with a little additional agitation. It may be necessary under exceptional conditions to raise the temperature to between 65° and 70° F.

Cream that is too thin or too rich frequently will churn hard. Raising the churning temperature will cause the butter to break, but in that case it is likely to be soft. Cream should contain about 30–35 per cent milk fat to churn satisfactorily.

Sweet cream is sometimes difficult to churn. If pasteurized,[3] or if ripened to a moderate acidity, cream will churn more easily. Too much acidity will injure the quality of the butter.

[3] If pasteurizing of cream in the home is desired, it is recommended that the cream be heated to 150° F and left at that temperature for 30 minutes and then cooled as rapidly as possible. The heating should be done in a pan or kettle of water, so arranged that the water can circulate under and around the vessel containing the cream.

When the churn is too full it is impossible to agitate the cream sufficiently to produce churning.

Ropy fermentation of the cream makes it too viscous to permit concussion. This trouble may be prevented by sterilizing all the utensils, and producing the milk and cream under the most sanitary conditions.

Sometimes an individual cow will produce cream that is difficult to churn. The only remedy for this condition is to obtain cream from a cow recently fresh, or cream that is known to churn easily, and before ripening mix it with the cream that is difficult to churn.

Cream produced by cows that are far advanced in the period of lactation is frequently difficult to churn. The effect may be at least partially overcome by adding, before ripening, some cream from a cow which is not so far advanced.

Cottonseed meal and alfalfa hay cause the cow to produce hard fats which may be difficult to churn. Linseed meal, gluten feed, and succulent feeds such as silage, roots, and green grass will cause the cow to produce soft fats, which churn more easily.

WASHING

The object of washing butter is to remove the buttermilk. The only effective method is to wash the butter when it is in small granules, so that the largest possible surface is exposed to the water. To try to remove buttermilk by working it out of the butter is not effective; moreover, the excessive working injures the grain and body of the product.

While the last of the buttermilk is draining off, the wash water should be prepared, with a temperature the same as that of the buttermilk. Only pure, clean wash water should be used, and the quantity should be twice that of the buttermilk. The water should be placed in a pail or other receptacle and tested with a thermometer; if necessary, it should be tempered by the addition of either warm water or ice. When the butter granules are too soft, the wash water should be a few degrees colder than the buttermilk. If the butter granules are too hard the wash water should be a few degrees warmer than the buttermilk. Warm water has the same effect upon the body of the butter as high churning temperatures, whereas cold water makes the butter so hard that it can be worked only with great difficulty. If the water is very cold, the proper incorporation of the salt is practically impossible.

After the buttermilk has been drawn off, one-half of the wash water is poured into the churn. The cover is then replaced, and the handle

given about four rapid revolutions. The wash water is drawn off, and the washing repeated. Two washings usually suffice, the second wash water when drawn off usually being almost clear.

SALTING

While the wash water is draining off, the bowl and ladle should be removed from the cold water. The butter, which is still in the granular condition, is removed from the churn, placed in the bowl, and weighed. Next, the quantity of salt is calculated on the basis of ¾ ounce for each pound of butter, although it may be varied to suit the personal taste. The best grade of butter salt or table salt should be used. The butter should be spread out in the bowl, about two inches thick; and the salt, free of lumps, should be sifted upon it.

WORKING

The butter is then pressed with the back or round side of the ladle (fig. 4) to remove the excess moisture, care being taken to press and not rub or smear it. After being pressed into a thin layer, it is folded upon itself into a pile, and the pressing repeated. The working is continued until an even distribution of the salt and a desirable grain and body have been produced.

The working of the butter, being a very important step in the making process, should receive careful attention. Too much working is a common fault in homemade butter. Overworked butter has a sticky and salvy body, a dull greasy appearance, and a gummy grain. It feels warm in the mouth, sticks, and dissolves slowly. Properly worked butter has a waxy body and a bright appearance, feels cool, and dissolves quickly in the mouth. Butter has a proper grain if a slab breaks when bent at an angle of about 45 degrees and the broken surface has the appearance of broken steel. In addition, overworking of butter injures its keeping properties.

Underworked butter is brittle, may be gritty because of undissolved salt, and, worst of all, may be mottled or uneven in color. Mottles are caused by the uneven distribution of salt, the deeper-colored streaks or spots containing more salt than those of lighter color. To prevent that condition, the butter must be worked until there is an even distribution of salt. When underworked, especially if highly salted, the butter is liable to be gritty because of undissolved salt. That fault will not occur in properly worked butter unless an excess of salt has been added. Cold and very firm butter requires more working than that which is comparatively soft.

PRINTING

When the butter has been properly worked, it is ready to be made into prints, though printing may be unnecessary when the quantity is small and will be used immediately. The printer is pressed upon the butter on a flat table until it is completely filled, the surplus is then scraped off,

Fig. 4.—Work butter by pressing with the back of the ladle.

and the print is pressed out on parchment wrapping paper. Prints should be wrapped in white parchment paper for the purpose, 8 by 11 inches in size, and placed in a refrigerator or other cool place.

The churning utensils should then receive immediate attention. They should all be thoroughly cleaned according to the directions given in the section on cleaning utensils.

PICKLING BUTTER

Butter which will not be used during the week after it is made should be stored by pickling in a salt solution. It must be of the best quality,

since any off-flavors will become more pronounced during storage. The container used for pickling may be either a stone jar or a wooden keg, which must be well cleaned and scalded before the butter is put in. A keg, if used, should be soaked in a saturated salt solution for some time in order to kill any mold that it might contain.

The prints are packed closely into the container and then covered with a salt solution prepared by adding 2½ pounds of salt to each gallon of water, which has been previously boiled for 15 minutes and then cooled to as low a temperature as possible. If scales are not available for weighing the salt, a solution strong enough to float an egg will be satisfactory. A weight must be put on top of the butter to keep it below the surface of the brine, as may be done by inverting a porcelain plate over the butter and placing a weight over the plate. The container should be covered as tightly as possible and then stored in the coolest place available.

Butter may be taken from the brine at any time. If the prints are wrapped in parchment paper before pickling, they can be easily removed and readily handled. Care should be taken to make sure that the butter is covered with the salt solution, especially when only a few prints remain in the brine.

Butter stored in this manner will keep very well, depending upon the quality of the cream from which it is made and upon the temperature at which it is stored.

Those who purchase their butter can save several cents per pound by buying in large quantities, from a creamery, enough to supply their needs for three or four months. This butter can be stored by pickling as described above.

SUMMARY OF STEPS IN HOME BUTTERMAKING

1. Produce clean milk and cream. Cool the cream immediately and keep it cool. Clean and sterilize all utensils.
2. Ripen the cream at from 65° to 75° F until mildly sour. Always use a thermometer in order to know that the right temperature is reached.
3. Cool the cream to churning temperature or below, and hold at that temperature for at least two hours before churning.
4. Use a churning temperature, usually between 52° and 66° F, that will require 30 to 40 minutes to obtain butter.
5. Clean and scald the churn, half fill it with cold water, and revolve until the churn is thoroughly cooled; then empty the water.
6. Pour the cream into the churn through a strainer.

7. Add butter color, from 20 to 36 drops to a gallon of cream, except late in the spring and early in the summer.

8. Churn until butter granules are formed the size of grains of wheat.

9. Draw off the buttermilk through the strainer in the cover.

10. Prepare twice as much wash water as there is buttermilk, and at about the same temperature. Use the thermometer; do not guess at temperatures. Put one-half of the water into the churn with the butter.

11. Replace the cover, and churn rapidly a few times; then draw off the water. Repeat the washing with the remainder of the water.

12. Be sure that the butter is still in granular form when the washing is completed.

13. Weigh the butter.

14. Add salt at the rate of ¾ ounce to a pound of butter.

15. Work the butter until the salt is dissolved and evenly distributed. Do not overwork it.

16. Make into one-pound prints and wrap.

17. Clean the churn and all buttermaking utensils.

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